REMARKS

Claims 1-5 are pending in this application. By this Amendment, claims 1-5 have been amended and claim 6 has been canceled without prejudice to or disclaimer of the subject matter recited therein. Claims 2, 3 and 5 have been amended solely to correct informalities. Support for the amendments to claims 1 and 4 can be found, for example, at pg. 4, line 16 - pg. 6, line 34 of the specification. Thus, no new matter has been added.

I. September 12, 2008 Telephone Interview

Applicants appreciate the courtesies shown to Applicants' representative by Examiner Rojas during the September 12, 2008 personal interview. Applicants' separate record of the substance of the interview is incorporated into the following remarks. Specifically, claims 1 and 4 have been amended in accordance with the Examiner's helpful suggestions made during the interview.

II. 35 U.S.C. §103 Rejection

The Office Action rejects claims 1-5 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 7,215,064 (hereinafter "Mehta") in view of U.S. Patent No. 7,053,737 (hereinafter "Schwartz"), and further in view of U.S. Patent No. 6,504,118 (hereinafter "Hyman"). This rejection is respectfully traversed.

As agreed to during the September 12, 2008 telephone interview, the combination of Mehta, Schwartz, and Hyman fails to disclose or render obvious "a piezoelectric material with associated electrodes that, upon application of electric voltages, provides a piezoelectric switch operation that straightens the armature; the armature having a curved shape and being bent away from the fixed contact when in a switch open condition with zero applied voltage; wherein, during the piezoelectric switch operation, the piezoelectric material brings the armature and the moveable electrostatic electrode into a substantially parallel alignment with the fixed electrostatic electrode and the fixed contact and the moveable contact are spaced

apart, and wherein, during the electrostatic switch operation, the fixed and movable contacts are brought into contact and clamped together and the switch is closed under electrostatic force from the electrostatic electrodes," as recited by claim 1, and as similarly recited by claim 4.

Referring to Fig. 8A, for example, in a fourth embodiment of the invention, Mehta discloses a MEMS switch arrangement involving both piezoelectric and electrostatic effects. Mehta discloses an armature that includes piezoelectric layers 410 and 411 that is substantially parallel to a substrate 417 in a switch open condition. The armature undergoes an 'S' shaped deformation upon application of voltages with opposite polarity to upper electrode 415 and lower electrode 412 causing the metal pad 119 to move downward and come into contact with pad 120 such that the switch is actuated to the "ON" position (see Figures 8A-8C and col. 9, lines 49-61). Thus, the switch is closed (or clamped) under solely a piezoelectric effect. Although Mehta discloses the use of an additional electrode 421, this electrode is disclosed merely as an optional feature to further reduce the voltage required for actuation as compared to conventional electrostatic devices (see col. 9, lines 29-35).

In Mehta, it is the piezoelectric effect created by application of crossed voltages to the piezoelectric layers 410 and 411 that causes the armature to bend and the metal pad 119 to contact the pad 120 and actuate the switch to an "ON" position. In contrast, according to the presently claimed combination of features, during the piezoelectric switch operation, the armature is straightened and the piezoelectric material brings the armature and the moveable electrostatic electrode into a substantially parallel alignment with the fixed electrostatic electrode. However, the fixed contact and moveable contact remain spaced apart during the piezoelectric switch operation, and thus the switch is open. During the electrostatic switch operation, the fixed and moveable contacts are brought into contact and clamped together by electrostatic forces and the switch is closed.

Further, as agreed to during the September 12, 2008 telephone interview, Schwartz and Hyman fail to cure the deficiencies of Mehta. Schwartz and Hyman disclose only electrostatic MEMS switches, and fail to provide any disclosure of a piezoelectric switch operation that straightens the armature and a subsequent electrostatic switch operation that clamps the fixed and moveable contacts together and closed the switch.

The Office Action acknowledges that Mehta fails to disclose "the armature having a curved shape and being bent away from the fixed contact when in a switch open condition with zero applied voltage," as recited by claim 1, and as similarly recited by claim 4, and relies on Schwartz as allegedly curing this deficiency.

Applicants respectfully disagree that one of ordinary skill in the art would have been motivated to combine the disclosure of Schwartz with that of Mehta for reasons discussed below. However, even if one of ordinary skill in the art would have been motivated to combine the disclosures of Mehta and Schwartz, the combination fails to disclose "a piezoelectric material with associated electrodes that, upon application of electric voltages, provides a piezoelectric switch operation that straightens the armature ... wherein, during the piezoelectric switch operation, the piezoelectric material brings the armature and the moveable electrostatic electrode into a substantially parallel alignment with the fixed electrostatic electrode," as recited by claim 1, and as similarly recited by claim 4. As shown in at least Figs. 1, 2, 5A, 5B, 8 and 9 of Schwartz, the actuator arm remains bent as the switch moves to the ON-state. The actuator arm in Schwartz never attains a straightened position as it moves to the ON-state such that the arm and the electrical contact 134 are brought into a substantially parallel alignment with the electrode 120.

Further, one of ordinary skill in the art would not have been motivated to combine the disclosure of Schwartz with that of Mehta because the rationale that Schwartz discloses for bending the actuator arm away from the substrate (i.e. to minimize the OFF-state capacitance

while maintaining a low actuation voltage) does not apply to Mehta's MEMS device. Schwartz discloses that the actuation voltage is primarily determined by the distance between the electrostatic plate 120 and the portion of the electrostatic plate 140 closest to the plate 120, and because this distance is unchanged by the bend in the actuator arm, the actuation voltage remains low, while at the same time the OFF-state capacitance is minimized (see col. 7, line 61 - col. 8, line 15).

The MEMS switch of Mehta does not employ electrostatic plates that close the switch through electrostatic forces. Rather, Mehta discloses a piezoelectric MEMS switch that optionally may include a single additional electrode to provide electrostatic effects. Therefore, one of ordinary skill in the art would not have been motivated to bend the armature of Mehta away from the substrate based on the disclosure of Schwartz because the motivation for including such a feature in Schwartz is only applicable to solely electrostatic MEMS switches.

For at least the reasons presented above, the combination of Mehta, Schwartz, and Hyman fails to disclose or render obvious the combination of features recited by claim 1, and the similar features recited by claim 4. Therefore, claims 1 and 4 are patentable over the applied combination. Claims 2, 3 and 5 are also patentable for at least for at their dependency from claim 1 or claim 4 as well as for the additional features they recite.

III. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,

James A. Oliff
Registration No. 27,075

Srikant Viswanadham
Registration No. 60,111

JAO:SQV/hs

Attachments:
Petition for Extension of Time
Request for Continued Examination

Date: September 15, 2008

OLIFF & BERRIDGE, PLC
P.O. Box 320850
Alexandria, Virginia 22320-4850
Telephone: (703) 836-6400

DEPOSIT ACCOUNT USE AUTHORIZATION
Please grant any extension necessary for entry;
Charge any fee due to our Deposit Account No. 15-0461